Department of Defense
Report to the Congress

On

NAVY THEATER WIDE DEFENSE SYSTEM
(FORMERLY NAVY UPPER TIER)

Office of the Secretary of Defense
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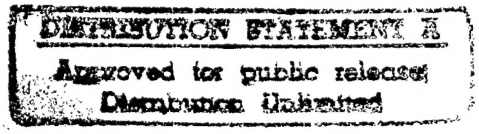

The conference report accompanying the National Defense Authorization Act for Fiscal Year 1996, 104-450, requests the Director of BMDO to provide a status report that summarizes the findings and recommendations of the various studies associated with the proposed Navy Upper Tier (Navy Theater Wide Defense System) program, including the Department's efforts to reduce risk and enhance competition. This document responds to this reporting request.

The studies that assessed the proposed Navy Theater Wide Defense System (NTWDS) program, technical issues and deployment options are the Navy's Theater Ballistic Missile Defense (TBMD) Cost and Operational Effectiveness Analysis (COEA), the BMDO/Navy Blue Ribbon Review and the BMDO "Capstone" TBMD COEA. A brief synopsis of each study, including the background, description, results, summary, and current status, is reported below.

The Department's Fiscal Year 1996 TBMD program review recently assessed the options for reducing risk and enhancing competition in the NTW program. A brief synopsis of this review is also included in this report.

NAVY THEATER WIDE TBMD STUDIES

I. NAVY TBMD COEA

BACKGROUND

Phase I of the Navy TBMD COEA was conducted to provide appropriate Defense Acquisition Board (DAB) milestone data in accordance with DoD 5000.2. A COEA objective was to support a Navy programmatic decision to support development and procurement of one or two TBM defensive tiers. The options studied were: only Lower Tier (Navy Area Defense System (NADS)); only Upper Tier (Navy Theater Wide Defense System (NTWDS)); or multi-tier combinations of both Lower and Upper Tier (Area and Theater Wide) TBMD. The Navy TBMD COEA analysis was performed within the context of the BMDO Capstone Operational Requirements Document (ORD) and the draft Naval TBMD ORD.

DISCUSSION

The analysis of the need for two tiers was performed at the system, unit, force, and campaign levels within the context of the mission needs and objectives using approved simulations. Extended Air Defense Simulation (EADSIM) was used in both the Capstone and Navy TBMD COEAs to provide a bridge between the documents. Critical conditions assumed for the Navy TBMD COEA were:

- End to end weapon system simulations
- Appropriate Battle Management Command, Control and Commur
- AEGIS cruiser (CG) and destroyer (DDG) based systems
- Both ballistic missiles and other air threats
- Various time frames (1997 to 2000, 2000 to 2010, 2010 to 2014)

RESULTS

The Navy TBMD COEA affirmed the requirement for the Navy Theater Wide Defense System. The combination of Area and Theater Wide TBMD provided the greatest capability. Specific findings for the combined systems included:

- More robust and flexible defense in depth
- Provided regional defense capability
- Covered more critical assets, more effectively
- Defeated longer range tactical ballistic missiles
- Had little effect on other Navy missions

II. BMDO/NAVY BLUE RIBBON REVIEW

BACKGROUND

BMDO and the Navy conducted two Terrier Lightweight Exo-Atmospheric Projectile (LEAP) missile flight test experiments in 1995. While FTV-3 and FTV-4 were successful in meeting most flight test objectives, neither of these two flight test missiles achieved body-to-body intercept of their targets. Various alternatives were proposed for the program's future direction; this led to the Blue Ribbon Review. A formal advisory committee was not chartered due to time constraints. However, due to the need to utilize experts, the experts were directed to prepare independent reports and provide them to a single individual for submission to the agency.

The Blue Ribbon Review was tasked by the Director of BMDO and the Assistant Secretary of the Navy (Research, Development, and Acquisition) to review options and recommend the preferred approach to continue development of the maturing Navy LEAP technology. After completion of the review, cost estimates of

each system option were completed.

DISCUSSION

The review was designed to achieve impartiality and to ensure responsiveness to Air Force, Army, and Navy views. The names and backgrounds of the individuals involved in the review are listed in the appendix. The individuals were directed to develop options for achieving a LEAP User Operational Evaluation System (UOES) capability, to develop a rigorous "apples to apples" comparison of LEAP alternatives, and to address, as a minimum, the following questions:

a. Has the LEAP experimental program to date validated the TBMD potential of a lightweight kinetic kill vehicle (KKV)?

b. How do you assess the technical and programmatic risks associated with the alternatives proposed for proceeding to a Navy Theater Wide UOES system? What are the technical trade-offs associated with proceeding directly to a tactical AEGIS LEAP system, versus an interim flight test configuration?

c. Has LEAP testing to date provided sufficient confidence to proceed to a UOES version of the tactical system? If additional risk reduction experiments or LEAP testing are indicated, what should the nature of these tests be?

d. What are the comparable costs and schedules for the alternatives to develop a Navy Theater Wide UOES capability? Are there steps which can be recommended which will achieve cost savings and/or improve the schedule for any of the alternatives proposed?

The Navy's Program Executive Officer for Theater Air Defense (PEO(TAD)) proposed three configurations for the LEAP missile: Hybrid LEAP, AEGIS LEAP, and a combination of the two, which would use a Hybrid LEAP configuration through initial intercept and the AEGIS LEAP configuration for the UOES version. The Hybrid LEAP missile was to combine the Terrier KKV with the Standard Missile-2 Block IV (SM-2 Block IV) propulsion stack. The AEGIS LEAP configuration was to place an improved LEAP, reduced in size to fit in the Mark 41 Vertical Launch System, and the SM-2 Block IV propulsion stack.

RESULTS

The Blue Ribbon Review released its findings on 3 October 1995 at a joint briefing to BMDO and PEO(TAD). The out-brief addressed the four specific questions listed earlier as follows:

Questions (a) and (c): The experimental program has sufficiently addressed the technical risks to allow the Navy to proceed towards a UOES capability with an intercept demonstration en route to UOES.

Question (b): An early successful intercept demonstration program has technical value on the path to fielded capability. A rigorous program of flight tests leading to an intercept demonstration is required as early as practicable.

Question (d): The schedule to UOES for all options is ambitious but not unreasonable. To improve on the probability of achieving cost and schedule, focus risk reduction on the minimum requirements for the most relevant phases of the program--sequentially, an intercept demonstration program, UOES, and tactical system.

The Review also prepared a list of overarching tasks that the program could follow:

a. Focus 1996 risk reduction on the intercept demonstration program, deferring lethality enhancements, discrimination enhancements for future threats, and a two-color seeker if there is conflict in resource demands.

b. Focus mid-term (1997-1998) risk reduction on well-defined UOES requirements and defer lethality enhancement to product improvements en route to the tactical system.

c. Force the system out of the experimental phase into disciplined engineering through the earliest possible UOES date.

SUMMARY

Of the three LEAP missile configurations considered, the review saw AEGIS LEAP as the least risky and most cost effective way to achieve a tactical system. A successful AEGIS LEAP intercept demonstration program was also considered an essential milestone en route to UOES. By deferring performance enhancements during the intercept demonstration, risk and resource conflicts could be kept within acceptable limits. The study has been completed and no further work is planned.

III. BMDO "CAPSTONE" TBMD COEA

BACKGROUND

As part of a Defense Department Program Decision Memorandum issued in August, 1994, BMDO was tasked to lead a Capstone-level TBMD COEA analysis with the involvement of the services. The guidance was to identify the most cost-effective mix of TBMD systems. The TBMD architectural alternatives assumed a baseline of Patriot PAC-2 and PAC-3 and THAAD. Additions to the baseline TBMD architecture included the Navy Area Defense System and advanced concepts such as the Navy Theater Wide Defense System and boost phase intercept systems.

Three operational situations were used to evaluate performance:

a. An overseas crisis having no land-based TBMD forces prepositioned or predeployed;

b. A developing theater with insertion of land-based forces under threat of TBM attack; and

c. Joint operations with all TBMD forces fully deployed at the start of conflict.

Two time frames were considered for the analyses: near term (1997 to 2002) and far term (2005 to 2010). Three geographical conflict areas were considered for the scenarios: Northeast Asia (NEA), Southwest Asia-North (SWA-N), and Southwest Asia-South (SWA-S). Phase one of the Capstone COEA began in October 1994 and was completed in October 1995.

DISCUSSION

A number of significant assumptions impacted the COEA results, including:

a. Only critical assets identified by the respective CINC were defended.

b. Threat and Blue forces were not interactive, i.e. they did not reflect attrition on either side or responses to successful attack or defense.

c. Only ballistic missile threats with unitary, high explosive warheads were considered in the core analysis.

d. Sensitivity to warning time was evaluated for cases of two and twenty-two days.

e. Each TBMD equipped AEGIS DDG and CG was assumed to have

either NADS or NTWDS capability.

f. The effects of Cooperative Engagement Capability were modeled.

g. Airlift sensitivity was evaluated by dedicating either 3.2% or 13.8% of total worldwide strategic airlift to TBMD.

Weapon system alternatives evaluated in an architectural context were:

a. Patriot PAC-2 and PAC-3

b. THAAD

c. Navy Area Defense System (NADS)

d. Navy Theater Wide Defense System (NTWDS) (AEGIS LEAP)

e. Navy Theater Wide Endo/Exoatmospheric (NTW-EE) (THAAD interceptor launched from ship)

f. Airborne Laser (ABL)

g. Airborne Interceptor (ABI) using Airborne Radar (ABR)

h. Space Based Laser (SBL)

Ship arrival rates were based on a fleet readiness and disposition status as of 15 May 1995. Variations on ship arrival rates were not evaluated. Ground forces' arrival in the theater was evaluated at arrival rates based on 3.2% of available airlift (and two days warning) or 13.8% of available airlift (and 22 days warning).

Primary measures of effectiveness used were defense of critical assets, threat missiles destroyed, blue forces' weapon inventory expenditures, and engagement opportunities (depth of fire).

RESULTS

Overall, multi-tier architectures provided the most effective and robust defense due to their large battlespace, coverage and engagement capability. The sea-based TBMD contribution to defense of a theater was greatest when the baseline of land-based systems was not fully deployed.

"Joint Operations" scenarios included fully deployed forces

(land, sea, air and space) before hostilities began without consideration of lift or warning time. The baseline architecture (PAC-3 and THAAD) always offered effective defense of critical assets if deployed before the commencement of hostilities. A slight improvement in numerical defensive results was obtained when sea-based TBMD assets were added to the architecture.

In an "overseas crisis" or "developing theater" scenario, full deployment of this architecture was dependent on warning time and available airlift. A "crisis," as defined for this study, included no land-based assets; a "developing theater" included the insertion of land-based defenses under threat of TBM attack. In both situations, the introduction of sea-based TBMD systems provided significant improvement to the overall performance of the architecture. In a "developing theater," the addition of sea, air or space-based systems mitigated dependence on pre-deployment, warning time, airlift, or combinations of the three.

Sea-based architectures with both upper and lower tiers were highly effective. They were the best alternative in a crisis scenario, which, by definition, precluded land-based systems. An example of this was seen in the combination of NADS and NTWDS in the SWA-N crisis scenario. The combination offered wide geographic coverage and low leakage. However, since sea-based lower tier coverage is confined to the coast, these architectures may not offer adequate protection of inland critical assets in all cases. Such architectures may have to be supplemented by land-based lower tier systems inland to ensure low leakage.

The sea-based Theater Wide system, because of the interceptor's projected performance and the ability to forward deploy the ship in certain scenarios, offers the potential to achieve ascent phase intercepts. The lower tier systems would be placed as close to the critical sea ports and coastal assets as water depth and ship maneuverability would allow.

Phase one of the Capstone COEA was completed in October 1995. Briefings of the COEA findings commenced in early 1996. Currently, the leaders of the study team are developing phase two Capstone COEA guidance and working with the Services to obtain their concurrence.

BALLISTIC MISSILE DEFENSE PROGRAM REVIEW

BACKGROUND

In July, 1995, the Under Secretary of Defense for Acquisition and Technology (USD(A&T)), Dr. Paul Kaminski, directed OSD and BMDO to

conduct a Theater Missile Defense program review.

RESULTS

The review achieved a balanced, affordable program which was more closely matched to countering the near-term TBM threat while investing in additional capabilities to defeat expected long-term threats.

The first priority in the program is to enhance the capability of the lower tier systems beyond the capability that is now deployed. In support of this objective, funds were added to the Patriot PAC-3 and Navy Area Defense (formerly Navy Lower Tier) programs in order to maintain development and deployment efforts.

The Department's next priority was the upper tier systems. The Department reviewed Navy Theater Wide carefully, looking at a range of options from $30 million per year to committing to the launch of a major program. The recommended approach was a middle ground, launching a concept development and technology demonstration program, not a full commitment to development and production at this time. This approach was based on three principal and one supporting factors. First was availability of outyear funding. The Department does not have outyear resources at present to maintain a development program. Second, the threat does not warrant this development at present. This view was concurred in by the JROC. Third, the technology is not yet mature for this program. The particular proposal, LEAP, is a narrow solution that might not be sufficiently robust to deal with the wide variety and extent of threats that could develop over time. The Department needs more time to look carefully at the kill vehicle and understand the alternatives. The supporting factor is the prospect for bringing allies into the program to share the development and production costs for the program.

BMDO will lead the concept definition studies to investigate potential interceptor kill vehicle configurations while BMDO and the Navy proceed to a system-level intercept flight, using the combination of the AEGIS platform, the Standard missile launch and propulsion vehicle, and a variation of the LEAP kinetic warhead. Through the FYDP, about $600 million was added to this program.

IMPLEMENTATION, RISK REDUCTION, AND COMPETITION

THAAD and Navy Theater Wide, both "upper tier" weapon systems, occupy different positions in the BMDO "Family of Systems." Objectively, an enemy missile would be engaged throughout its entire flight trajectory. Navy Theater Wide is proposed to be an exo-atmospheric interceptor designed to engage enemy TBMs in the post-boost, ascent, midcourse and descent phases of its trajectory. THAAD is a ground-based, transportable system capable of engaging enemy TBMs in both the exo- and endo-atmospheric regimes and is designed to defend a fixed geographic region. Therefore, these systems have complementary roles within the TBMD architecture. The cost of defense systems procurement provides an incentive for BMDO to ensure that all systems maximize common elements, technologies, and infrastructure. Because the Navy Theater Wide system is relatively immature, the infusion of common, complex technologies from other ballistic missile defense kinetic kill vehicle (KKV) programs and systems, including THAAD, has been given a high priority. The objective is to ensure that the Navy Theater Wide system meets performance requirements throughout its assigned battlespace by leveraging off of technological advances made for other KKVs. Whereas a "fly-off" competition forces the elimination of one or more systems within the overall TBMD architecture, determining areas of commonality forces a competition among system components--even though the parent weapon systems have different capabilities within the same theater.

BMDO is leading a joint systems engineering team (JSET) to conduct a kinetic kill vehicle (KKV) technology assessment effort, as well as proceeding with the system-level intercept program. To resolve KKV technical issues, the program is directed to assess the potential of various alternative kill vehicle technologies under development to include those being developed in the LEAP, Theater High Altitude Area Defense (THAAD), Atmospheric Interceptor Technology (AIT) and Exoatmospheric Kill Vehicle (EKV) programs.

The KKV assessments will recommend, where appropriate, the most effective and cost-efficient technologies for further risk reduction activities and inclusion into a Navy Theater Wide tactical interceptor. BMDO plans to forward these findings as recommendations in 1998, and propose exit criteria for potential entry into Engineering and Manufacturing Development (EMD) in the 2001-2002 time frame. The JSET will formulate interceptor concepts for further review by the BMDO System Design Board.

A parallel program has been designed to validate the expected guidance-to-hit capabilities of a lightweight KKV by proceeding to a system-level intercept solution employing the AEGIS/Standard

Missile/VLS/LEAP system. The intercept program should demonstrate the dynamic capability of a LEAP-derived KKV that could provide the basis for fielding of a UOES capability and entry into EMD.

SUMMARY

The BMD Program Review was implemented in the Fiscal Year 1997 President's Budget submission. The JSET has been established and is meeting regularly in order to establish the study framework and report its recommendations for the optimal approach for the Navy Theater Wide Defense System.

APPENDIX

BLUE RIBBON REVIEW PERSONNEL

The review was conducted by six individuals, mutually agreed upon by BMDO and the Navy, all having expertise in the areas of missile guidance and control, kinetic kill vehicles, weapon systems, test and evaluation processes, software and simulations, and military operations. The personnel were:

- General Larry D. Welch, USAF (Retired) - Chairman
- Lieutenant General C. J. Levan, USA (Retired)
- Rear Admiral Wayne E. Meyer, USN (Retired)
- Rear Admiral George R. Meinig, USN (Retired)
- Dr. Edward T. Gerry
- Mr. Marion E. Oliver